Impact Case study template

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Country / Region:	West Africa
Project or Programme:	AMMA-2050
Relevant Area of Change[1]	Strengthening scientists' capacities to develop decision-relevant information, Area of Change 2

Type/purpose of case / story *(Please note that more than one box may be marked if relevant)*	Learning	x
	Illustrative	
	Comparative	
	Representative	

Introduction (suggested 10%)

This impact case study highlights the cross-institutional development of knowledge and capacity building amongst African climate scientists partnering in the AMMA-2050 project. The case study highlights the value of strengthening scientific capacities to enable co-production of decision-relevant climate information, illustrating FCFA Area of Change 2.

Part of the co-production of climate information in AMMA-2050 included the development of an atlas containing information about projected future climate changes in West Africa, or climate metrics, that are relevant to supporting medium-term decision making. Such metrics included information on annual rainfall and the number of extreme precipitation days per year. In line with the capacity building aims of AMMA-2050, it was decided that the production of this atlas would be undertaken by African climate scientists who would be trained and supervised by UK-based climate scientists with more coding experience. Training African scientists in the scientific coding methods

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1. [1] FCFAs Areas of Change are:Enhancing scientific knowledge and prediction of African climate and new understanding of the resulting impact on the robustness of future climate change scenarios.
2. Strengthening scientists' capacities to develop decision-relevant climate information.
3. Increasing the capacities of users/decision making bodies/institutions to appropriately integrate climate information within medium-term decision-making.
4. Approaches that support co-production of decision-relevant climate information and enable channels for on-going dialogue between the providers and users of climate information.
5. Identifying social, political, behavioural and economic barriers to the use of climate information in long-term decision-making, working to elicit solutions which support effective integration of climate risks within decision making across scales, sectors and social groups.
6. Approaches to climate science research and climate-sensitive risks within medium-term decision making which enable active participation and address of the specific concerns of women and marginalised groups.

needed to analyse ensemble climate data has allowed for improved capacity to interrogate climate change impact projections within the AMMA-2050 scientific team, as well as providing strengthened scientific capacities across a number of West African countries.

The change story (suggested 30%)

One of the core aims of climate scientists involved in AMMA-2050 is to provide advice and expert judgement of the projected changes in high-impact climate metrics in the future. This strategy included the production of climate atlases of projected changes in user-relevant metrics for the wider West African region, as well as to inform the project's two pilots, respectively focused on flood-risk management within Ouagadougou city planning and climate-resilient agriculture in Senegal. The metrics within each atlas were selected by stakeholders and non-climate science AMMA-2050 members and include:

- Annual rainfall totals
- Change in frequency of extreme precipitation days
- Change in frequency of dry spells
- Monthly temperature trends

The production of such metrics is relatively straightforward for someone with knowledge of scientific coding and experience working with large-scale climate ensemble data, such as the Coupled Model Inter-comparison Project version 5 dataset (CMIP5). However, for someone with minimal knowledge of scientific coding, production of the required metric data is not possible. The decision was made to combine production of the climate change atlases with a Python scientific language training course for African climate scientists involved in AMMA-2050. The week-long training course was planned and overseen by scientists from the Met Office, the Centre for Ecology and Hydrology – Wallingford, and the University of Leeds with the course held in Leeds in December 2016. Eight African climate scientists were invited to the course with the aim of learning the required skills to produce the climate metrics atlases for AMMA-2050.

Two scientists from each of the four partnering universities - Université Cheikh Anta Diop (UCAD), Agence Nationale de l'Aviation Civile et de la Météorologie (ANACIM), University of Cape Coast (UCC), and Université Félix Houphouët-Boigny (UFHB) - were invited to the course. Prior to the event, the coding aptitude of each scientist was requested in order to tailor the course to individual skill levels. Participants' aptitude ranged from minimal/no experience to high levels of aptitude in computer programming, but no experience of Python. The three workshop supervisors provided individual tuition for scientists with the least coding experience and continual guidance for all participants throughout the week.

By the conclusion of the training course, participants had received sufficient tuition to complete the climate atlas metrics with sporadic advice available from UK-based scientists when requested. The training course allowed for the successful completion of the climate atlases, as well as improving the ability of African researchers on AMMA-2050 to interrogate climate data for themselves, and provide training at their own institutions on computer programming.

The training project also allowed early career researchers from AMMA-2050 to become better acquainted. Outside of annual meetings, there are not many opportunities to build personal relationships between early career researchers within AMMA-2050. The personal relationships built during this workshop have developed throughout the timeframe of AMMA-2050 and have led to several collaborative projects between attendees that may not have otherwise taken place.

Analysis (suggested 30%)

African scientists partnering in the training have been able to use the expertise acquired through the Python training in a wide range of way, as illustrated by excerpts from participants' testimonies included below. Participants have, for example, shared the training with colleagues and students in their respective institutions and developed climate projections, directly contributing to development planning.

Youssouph Sane, who works at ANACIM in Senegal, was able to use the training on metrics to 'provide Senegal's climate projections for 2100, contributing to developing the National Determined Contributions'.

Siny Ndoye at UCAD, Senegal, noted that 'the week-long course at the University of Leeds *allowed me to know other scientists of the AMMA-2050 project' and enabled him to share the knowledge, 'training UCAD master's students in programming with Python'. He used Python to calculate the mean temperature range, the climatology, the mean diurnal temperature range, the seasonal average minimum Temperature (Tmin) or maximum Temperature (Tmax), the number of days per year that maximum Temperature is superior than a specific Threshold. These metrics are important for the production of the atlases of climate metrics over Senegal.*

Adama Bamba from UFHB, Cote d'Ivoire, has used the Python coding to calculate a range of climate metrics, such as the Standardized Precipitation Index (SPI), the extreme rainfall Precipitation Extreme events and Seasonal temperature, as well as for analysis of historical data and for climate projections up to 2100. He has also been providing python training to UFHB Masters Students on the **Climate**, *Natural, Resources, and Innovation and Climate and interaction courses, and is trying to introduce it into the UFHB Masters' programme. He also noted that 'because the training we had on python, I'm easily collaborating with researchers from CEH, Universite Cheikh Anta Diop, ANACIM, University of Leeds, and University of Cape Coast'.*

While two scientists were not able to take part in the Leeds workshop, due to visa constraints, they have nevertheless benefited from learning passed on by their colleagues, enabling them to improve their programming skills and use python as a secondary tool for data analysis.

Learning (suggested 30%)

While co-production of climate information often focuses on interactions between scientists and decision makers, it also entails the ability of scientists from across different institutions to bring

together their respective areas of knowledge. Moreover, sustainable capacities for co-production necessitate the establishment of the required national and regional expertise.

Whilst production of the climate atlases could have been undertaken quicker by the three workshop supervisors (given their prior experience of Python and ability to produce the metrics quickly), such a method would not have improved the capacity of African scientists to expand their own analysis and education. The effort required to organize and lead the Python training workshop, as well as the time spent overseeing the production of atlas metrics by African scientists was substantial, However the benefits to partnering institutions and the wider West African region are significant. Such investment in training courses, whilst taking time and effort, provide enough positive outcomes in terms of capacity building to demonstrate the sustainable strengthening of African climate science expertise, one of the principal desired outcomes of the FCFA programme.